EXPLANATION OF PLATE VII.

Fig. 1. *Athorybia californica.* A view from the side, showing the hydrophyllia more or less expanded; tentacles and polypite extended. Drawn from a living specimen.

Fig. 2. Single tentacular knob very much magnified.

Lettering.

a. Apex of sacculus.
f. Float.
hc. Hydrophyllium.
i. Involucrum.
p. Polypite.
pd. Peduncle of the tentacular knob.
s. Sacculus.
t. Tentacle.
tf. Terminal filament.
tk. Tentacular knob.
ts. Taster.
tv. Terminal vesicle.

Cambridge, U. S. A.,
November, 1888.

XXII.—*Further Observations on the Foraminiferal Genus* Orbitoides *of d'Orbigny.* By H. J. Carter, F.R.S. &c.

Since my observations on the genus *Orbitoides* of d'Orbigny were published ('Annals,' 1888, vol. ii. p. 439) I have received several type specimens of *Orbitoides media* from the Upper Chalk in the south-west of France, which, being the same in specific characters as those from the Chalk of Maestricht that I had already described (*op. et loc. cit.* p. 445), have enabled me personally to compare the two, which previously I had only been able to effect by quoting M. le Vicomte d'Archiac's description of this fossil under the name of "*Orbitolites media*" (*ib.* p. 446).

For this welcome present I am indebted to my kind friend Mons. G. Berthelin, formerly of Nantes, now residing in Paris, whose valuable contributions to the knowledge of Foraminifera are well known, and who, on learning from the paper to which I have alluded that I had no specimens of "*Orbitoides media*" from France to compare with d'Orbigny's illustrations, immediately sent me twenty, labelled "*Orbitoides media,* d'Archiac, sp. Dordonien (Craie supér.), Meschers (Charente-Inf.), près Royan." These appear from their smallness, varying from 5-48ths to 6-24ths inch in horizontal diameter, to belong to the lesser size mentioned by d'Archiac as probably being young forms of his larger one rather than a different species, which measured "50 millim." in diameter (*op. et loc. cit.*).

Be this as it may, these specimens are sufficient to show after careful examination not only that they are identical in their specific nature with the specimens from Maestricht, but that they entirely accord with d'Orbigny's illustrations in his 'Cours Elément. de Palćont. et de Géologie' (vol. i. p. 193), being therefore genuine varieties of, if not identical with my *Orbitolites Mantelli* ('Annals,' *l. c.* p. 442). Thus I observe that the vertical papillary eminence of the crust on *each* side of the central plane, although only seen on one side in the specimens from Maestricht, is perfectly developed on both sides in those from the south-west of France, and therefore identical with d'Orbigny's "Profil" ('Cours,' *l. c.*); also that the sinuous lines on the surface radiating from this eminence to the circumference in d'Orbigny's adjoining representation are equally identical. These lines are intended for ridges of shell-substance continuous with that forming the central eminence, and radiating at first singly from this point become so multiplied by subdivision afterwards (that is as they approach the circumference) as to spread all over the disk. Originally they are derived from the union of granulations which more particularly characterize the specimens from Maestricht, where they may be seen to be the outer ends of the "conical columns" to which I have alluded in my description of this form ('Annals,' *l. c.* p. 445).

Still this does not interfere with what I have endeavoured to point out, viz. that the cells of the central plane of d'Orbigny's *Orbitoides media* present in the horizontal section a *spheroidal* form, and that those of his *Orbitoides papyracea* ('Cours,' vol. ii. p. 732) are *rectangular*—a distinction which it is desirable to bear in mind, as at present the term "*Orbitoides*" is indiscriminately used for both kinds, so that it is not known when this term is mentioned which kind is meant, a circumstance that the following paragraph will show to be likely to lead to confusion both palæontologically and geologically.

At present we know that *Orbitolites Mantelli* has been found in the midst of a bed of *Nummulites sublævigata* in Sind, and *Orbitoides dispansa* in one of *N. exponens* at Lukput, in Cutch, in confirmation of which I now possess specimens. Hence it is possible that all three may exist somewhere together. But there are no Nummulites with *Orbitolites Mantelli* in the Claiborne beds of Alabama, none that I could see in the bed of the cliff at Takah, on the south-east coast of Arabia, nor in the specimens from the bed at Nal, in Jhalawan, nor in those from that of the bank of the river Irrawadi discovered by Mr. Theobald—circumstances which

a more extended acquaintance with the strata of the Eocene series may explain.

With the distinction to which I have alluded, it became necessary to establish a separate division for the discoid Foraminifera typified by *Orbitolites Mantelli*, and this, which I proposed in 1861 ('Annals,' vol. viii. p. 328), was done by Gümbel seven years afterwards under the name of "*Lepidocyclina*" ('Beiträge zur Foraminiferen-Fauna der nordalpinen Eocängebilde,' München, 1868). In short Gümbel in this work has divided d'Orbigny's "*Orbitoides*" into five subgenera, reserving the fifth for the kind typified by my *Orbitolites Mantelli*, and devoting the rest to that typified by *Orbitoides papyracea*.

Of course the subgeneric name "*Lepidocyclina*" would thus take the place of "*Orbitolites*;" but if it can be reasonably inferred that *Orbitolites Mantelli* is but an evolutionary development of Lamarck's genus "*Orbitolites*" and evolutionary doctrine is to have influence on nomenclature, then the propriety of introducing a new name for anything coming from the latter seems undesirable. It was this that influenced both Faujas de St.-Fond and d'Archiac in using the generic term "*Orbitolites*" for this fossil. Hence the term "*Orbitoides*" might be retained for the kind typified by *Orbitoides papyracea*, and that of *Orbitolites* for those typified by *Orbitolites Mantelli*, while the whole, together with *Nummulites*, might be included, as proposed by Carpenter, in the family "Nummulinida" ('Introduction to the Study of Foraminifera,' p. xiv, 1862).

I have already adduced reasons based on evolutionary views for using the term *Orbitolites Mantelli* ('Annals,' 1888, vol. ii. p. 442), to which I might add that the papillary eminence on *Orbitoides media*, d'Orbigny, is almost always represented on *Orbitolites marginalis*, Lam. (that is the *recent* species), by an accumulation of shell-substance on the centre of the disk possessing an irregularly stellate form, whose rays extend for a short distance towards the circumference, and that, although the *cells* in most instances do not present the foramina on the surface which are observed in the cell-divisions of *Orbitoides media*, d'Orb., in a horizontal section of the crust, yet in some from the Red Sea (Suez) in my cabinet they are unmistakably present in by far the greater number of cells, although in *their* midst are to be seen some which do not possess them. Why they should be so generally absent in most specimens may be accounted for by the free communication which exists between the interior and exterior of the organism through the numerous apertures on

the margin, the cells (stolonigerous buds), after their first development, breaking into each other so generally that the whole is thus resolved into a cancellated structure (calcareous skeleton) filled with continuous sarcode, which issues into the circumambient medium by the way mentioned, as in such-like Foraminifera. Hence this structure in the central plane of *Orbitolites Mantelli*.

Dr. Carpenter, in his admirable "Monograph of the Genus *Orbitolites*" (Phil. Trans. 1856, p. 196, pl. vi. fig. 5), denies the presence of holes in the "shelly substance of the calcareous disks" of *Orbitolites*, but adds that the "punctated marking" here "may be regarded as the rudiments of those minute closely-set apertures which in many Foraminifera give passage to pseudopodial extensions of the sarcode." Whether this is the case or not I cannot say; but where the holes in the cells are manifest they are situated respectively on little tubercles as in other Foraminifera.

The holes seen in the cell-divisions of *Orbitoides media*, d'Orb., in a mounted microscopic horizontal section of the crust are merely transverse sections of the minute tubuli which extend perpendicularly from one cell to another; and even these are not visible on the surface of *Orbitolites Mantelli* from Alabama, where the cellular structure is finally covered in by a thin film of ? imperforate homogeneous shell-substance. While in the fossilized Orbitolite from the neighbourhood of Jarrak, in Lower Sind, &c., which I have designated "*pedunculata*" ('Annals,' 1861, vol. viii. p. 463, and delineated in that of 1853, vol. ii. pl. vii. figs. 43–45), the peduncle or papillary eminence is formed of shell-substance, from which sinuous ridges are extended to the circumference in the same way as that represented by d'Orbigny in his illustrations of *Orbitoides media* (*op. et loc. cit.*). I have already alluded to this structure in the 'Annals' of 1861 (*l. c.*).

So that altogether, part for part, we have the same structures in *Orbitolites media* as in *Orbitolites marginalis*, saving the "crust," and hence the reason for retaining the term "*Orbitolites*" in generic distinction.

Let us now, in conclusion, direct our attention *more particularly* than I have hitherto done to the structure of this "crust," for, looking at it in the vertical section, it is seen to be composed of columns of vertically compressed cells, which are arranged more or less perpendicularly according to their position on each side of the central plane, in such a manner as to lead to the inference that they are a direct prolongation vertically of the spheroidal ones whose regular arrangement in the central plane, when viewed horizontally, gives rise to

the characteristic engine-turned pattern to which I have alluded, and that any horizontal section through any part of this crust would present this pattern. But this is not the case, inasmuch as the thinnest horizontal section beyond the central plane shows that horizontally these compressed cells are not only very variable in size, but present the utmost irregularity in outline that can be conceived, so that it becomes impossible to trace any *direct* communication between any of them and those of the central plane respectively; while the nearer the columns approach the surface the more these cells (although they intercommunicate with each other throughout by the "minute tubuli" to which I have alluded) become approximated, till at last, in the Alabama species, they are covered in by the smooth homogeneous layer of shell-substance also above mentioned. Hence, like most of the specimens of *Orbitolites marginalis*, the only means of communication externally in *Orbitolites Mantelli* was through the apertures in the margin, the "central plane."

That varieties of the kind typified by *Orbitolites Mantelli* will be hereafter found I have no doubt; and Gümbel has already added two under his subgenus "*Lepidocyclina*," viz. "*L. dilatata*" and "*L. burdigalensis*" (*op. et loc. cit.*).

But that "*Orbitolites*" of Lamarck should be used as the generic name for the type of Morton's *Nummulites Mantelli* of the Claiborne beds in Alabama (as I first proposed) instead of "*Lepidocyclina*" seems to me, on the grounds that I have stated, to be most desirable; while as regards *priority* in nomenclature we find that as far back as 1799 Faujas de Saint-Fond (in his Nat. Hist. de la Montagne de Saint Pierre de Maestricht) stated in explanation of his "fig. 4" respecting *Orbitoides media*, d'Orb., that "Cette numismale n'étant pas formée par des cloisons transversales, rentrerait, d'après Lamarck, dans ses *Orbitolites*."

XXIII.—*The Siphonophora of the Canary Islands.*

By Prof. Carl Chun *.

During my residence in Orotava I directed my attention chiefly to the study of the Canarian Siphonophora. I succeeded in discovering, besides the Canarian forms described

* Translated from the 'Sitzungsberichte der königl. preuss. Akademie der Wissenschaften,' 1888, no. xliv. pp. 1141–1173. This is the first section of a "Report upon a Journey to the Canary Islands performed in the winter of 1887–88," and is preceded by a short statement of the cir-